10-25-1956

Test 603: Massey-Harris 333 (Gasoline)

Tractor Museum
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The Experiment Station
University of Nebraska College of Agriculture
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NEBRASKA TRACTOR TEST NO. 603

MASSEY-HARRIS 333 GASOLINE

Department of Agricultural Engineering
Dates of test: October 25, 1956 to November 3, 1956
Manufacturer: MASSEY-HARRIS-FERGUSON, INC., RACINE, WISCONSIN
Manufacturer's rating: Not rated

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling medium	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST B—100% MAXIMUM LOAD—TWO HOURS								
41.89	1500	3.574	11.72	0.523	168	53	67	28.910
TEST C—OPERATING MAXIMUM LOAD—ONE HOUR								
39.84	1500	3.220	12.37	0.495	165	51	64	28.915
TEST D—RATED LOAD—ONE HOUR								
37.11	1500	3.010	12.33	0.497	163	50	62	28.918
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
37.10	1501	3.000	12.37	0.496	162	50	62	.....
1.16	1592	0.993	1.17	5.250	153	48	60	.....
19.43	1566	2.021	9.61	0.638	158	49	61	.....
36.64	1371	2.966	12.35	0.496	165	49	60	.....
9.83	1584	1.478	6.65	0.922	154	49	60	.....
28.97	1559	2.550	11.36	0.540	160	49	61	.....
22.19	1528	2.168	10.24	0.599	159	49	61	28.922

TEST L—OPERATING MAXIMUM TORQUE

% of rated rpm (engine)	100	95	91	85	80	76	71	66	61	56	50
% of rated-speed torque	100	101	102	102	103	104	105	105	106	107	105

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lbs	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hr	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Temp. Deg. F.: Cooling med	Temp. Deg. F.: Air wet bulb	Temp. Deg. F.: Air dry bulb	Barometer inches of mercury
TEST H—RATED LOAD—TEN HOURS—3rd Gear Hi Range											
29.71	2262	4.93	1500	3.76	2.778	10.69	0.573	156	45	50	28.781
TEST F—100% MAXIMUM LOAD											
37.26	2871	4.87	1499	4.92	3rd gear hi range....			166	58	64	28.720
TEST G—OPERATING MAXIMUM LOAD											
18.91	5407	1.31	1501	12.58	1st l.r. (part throttle)			155	46	53	28.780
28.45	5418	1.97	1503	12.99	2nd l.r. (part throttle)			158	46	53	28.780
34.30	4714	2.73	1500	9.13	3rd low range.....			160	46	50	28.780
35.24	3619	3.65	1497	6.34	4th low range.....			160	42	49	28.800
33.08	1534	8.09	1499	3.02	5th low range.....			156	45	48	28.795
32.29	5423	2.23	1500	12.52	1st h.r. (part throttle)			159	46	53	28.780
34.71	3616	3.60	1500	6.54	2nd hi range.....			158	45	48	28.805
35.05	2689	4.89	1504	4.78	3rd hi range.....			158	45	50	28.795
33.82	1972	6.43	1501	3.52	4th hi range.....			158	44	47	28.805
28.36	759	14.01	1499	1.34	5th hi range.....			158	42	48	28.795
TEST J—OPERATING MAXIMUM LOAD											
34.14	2634	4.86	1501	5.34	3rd gear hi range ...			164	48	60	28.545
TEST K—OPERATING MAXIMUM LOAD											
34.00	2779	4.59	1497	6.42	3rd gear hi range...			157	45	59	28.560

TIRES, WHEELS AND WEIGHT

	Tests F, G, & H	Test J	Test K
Rear wheels			
Type	Cast iron	Cast iron	Cast iron
Liquid ballast	738 lb each	None	None
Added cast iron	290 lb each	None	None
Rear tires			
No. and size	Two 12-38	Two 12-38	Two 11-38
Ply	6	6	4
Air pressure	18 lb	14 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	None	None	None
Added cast iron	None	None	None
Front tires			
No. and size	Two 6.50-16	Two 6.50-16	Two 6.50-16
Ply	4	4	4
Air pressure	28 lb	28 lb	28 lb
Height of drawbar	19½ inches	20 inches	18 inches
Static weight			
Rear end	6260 lb	4205 lb	4042 lb
Front end	1540 lb	1540 lb	1526 lb
Total weight as tested with operator	7975 lb	5920 lb	5743 lb

FUEL, OIL, WATER and TIME Fuel Gasoline **Octane No.** ASTM 81.6 **Research** 87.5 (rating taken from oil company's typical inspection data) **Weight per gallon** 6.130 lb **Oil** SAE 10 **To motor** 2.219 gal **Drained from motor** 1.246 gal **Water used** none **Total time motor was operated** 43½ hours.

CHASSIS Type Tricycle **Serial No.** 333 GIRF 22173 **Tread width rear** 56" to 88" **front** 8.5" to 15.3" **Wheel base** 88⅛" **Hydraulic control system** direct engine drive **Advertised speeds mph** first Lo 1.47 first Hi 2.51 second Lo 2.22 second Hi 3.79 third Lo 2.95 third Hi 5.03 fourth Lo 3.84 fourth Hi 6.55 fifth Lo 8.21 fifth Hi 14.00 reverse Lo 1.93 reverse Hi 3.30 **Belt pulley diam** 13½" **face** 6½" **rpm** 876 **Belt speed** 3097 fpm **Belt** flat **Length** 71' **Width** 6" **Thickness** 0.215" **Maximum slip** 0.58% **Clutch** foot operated single dry plate **Seat** pressed steel on conical spring with shock absorber **Brakes** internal expanding shoe operated by two foot pedals **Equalized** by locking together **Power take-off** direct engine drive with independent clutch **Steering** aided by hydraulic power steering.

ENGINE Make Massey-Harris **Type** 4 cylinder vertical **Serial No.** MEA 208G1842 **Crankshaft** mounted lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 3 11/16" x 4⅞" **Rated rpm** 1500 **Compression ratio** 7.15 to 1 **Displacement** 208 cu. in. **Port diameter valves** inlet 1 5/32" **exhaust** 1 3/16" **Governor** variable speed centrifugal **Carburetor size** 1" **Ignition system** battery **Starting system** 12 volts (two-6 volt batteries) **Air cleaner** oil washed wire mesh **Muffler** was used **Oil filter** replaceable treated paper element **Cooling medium temperature control** thermostat.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with carburetor set for 100% maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G, H, J, K and L were made with an operating setting of the carburetor (selected by the manufacturer) of 94.8% of maximum belt horsepower.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" Hg)	38.97	43.65
2. Observed maximum horsepower (tests F and B)	37.26	41.89
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (ASAE and SAE ratings)	29.23	37.10

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 603.

L. F. LARSEN
Engineer-in-Charge

L. W. HURLBUT
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissable include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel econonmy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each; rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

TEST L: This torque test is run with wide open throttle. Loads are applied to reduce engine speed in approximately ten 5% increments. Rated speed equals 100%. The corresponding dynamometer torque is recorded as a per cent of torque at rated speed.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. When rubber tires are used, all tests are made on the concrete test course. All crawler type tractors are tested on a dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lighest wheels offered by the manufacturer are used.